Suction or blow roll

The invention relates to a suction or blow roll for a machine for producing and/or finishing a paper, board, tissue or another fibrous web, having a rotatable perforated roll shell and at least one pressure region which extends over only part of the roll circumference and is formed by a stationary pressure box in the interior of the roll which is open toward the roll shell, the pressure box being connected to a negative or positive pressure source and being sealed off with respect to the roll shell by at least one sealing element.

When, in these rolls, the perforation leaves the pressure region, equalization takes place between the air pressure in the perforation and that of the surroundings. In consequence, in the case of blow rolls, the air flows out of the perforation and, in the case of suction rolls, into the perforation. This air flow causes considerable noise.

Irrespective of this, air leakage in the region of the sealing elements can also lead to the development of noise.

In order to counteract this, special sealing arrangements in the region of the pressure box have been developed but are not sufficiently effective and/or are too complicated.

It is therefore an object of the invention to reduce the noise emission considerably with simple means in rolls of this type.

According to the invention, the object has been achieved in that, at least on one sealing element, an at least substantially air-impermeable cover running in

the circumferential direction and arranged outside the pressure box and/or the roll shell adjoins or is arranged in the vicinity of a side wall of the at least one pressure box on the outer side of the roll shell, the cover either being in contact with the roll shell or having a spacing of less than 100 mm from the latter.

The cover is thus either totally air-impermeable or allows air through only to a low extent.

The cover is either arranged on the inner side of the roll shell, where it preferably adjoins a wall of the pressure box directly or, alternatively, the cover is fitted at a short distance from the wall of the pressure box. In a further alternative or additional arrangement of the cover, provision is made for the latter to extend outside the perforated roll shell. In this case, it projects as far as possible into the pocket between the roll shell and the belt which carries the fibrous web with it, in order to keep pressure losses as low as possible, or provision is made for the cover to reach the contact region between the belt and the roll shell, apart from a defined distance, in particular also a variable distance according to the invention. It goes without saying that combinations of covers located on the inside and/or outside can be produced in accordance with this invention.

In addition, it can also be advantageous to seal off the cover with respect to the roll shell, preferably at the axial ends.

This cover prevents the pressure equalization between the perforation and the interior of the roll considerably or even completely. As a result, pressure equalization is possible substantially only with the

outer region of the roll or, depending on the embodiment, substantially only with the inner region of the roll.

The water mist which is often present in the region of these rolls increases the flow resistance, so that pressure equalization takes place more gradually and therefore also with less noise. In addition, a negative pressure forms in the opening gap between the fibrous web or a belt supporting the latter and the roll at the end of the pressure region located in the direction of rotation and, in the case of suction rolls, counteracts ventilation of the perforation after the pressure region.

In order to reduce the air flow in the interior of the roll considerably, the distance between the cover and the roll shell should be less than 20 mm, preferably less than 10 mm.

Depending on the application and the requirements, the distance between roll shell and cover can be substantially the same everywhere or increase or decrease away from the pressure box or even fluctuate in the longitudinal and/or transverse direction of the machine.

It is particularly efficient if the cover adjoins a sealing element running approximately transversely with respect to the web running direction.

In this case, the air flow in the perforation can be reduced particularly considerably if a cover adjoins the end of the pressure box located in the direction of rotation.

With regard to the reduction of air leakage, however, it is also advantageous if a cover adjoins the end of

the pressure box located counter to the direction of rotation.

In order to be able to achieve the highest possible effectiveness of the cover, the cover should extend over a circumferential region of at least 10 mm, preferably at least over a circumferential region of at least 100 mm and in particular more than 200 mm.

It is particularly advantageous in this case if the cover extends in the circumferential direction over the entire region located outside the pressure box.

The greatest possible reduction in noise is of course achieved if the cover extends axially at least over the entire perforated region of the roll shell.

However, in order to minimize the expense, it may also already be sufficient if the cover extends axially over only part of the perforated region of the roll shell. This applies in particular to rolls having a plurality of pressure regions arranged axially beside one another. Here, the arrangement of the cover in the region of the pressure region with the highest negative or positive pressure may be sufficient.

On the suction or blow roll there is advantageously an adjusting device, by means of which a cover can be varied axially over its entire width or over part of its width with respect to its distance or its angle of attack in relation to the roll shell. The adjusting device can be adjusted hydraulically, pneumatically or mechanically, for example.

In a refinement of the invention, the position may be adjusted by a control device which comprises a controller. Depending on a controlled variable measured by a measuring device, said controller acts

via a signal variable on the adjusting device, which changes the position of a cover in accordance with the signal variable. The controlled variable measured by the measuring device is, for example, the pressure in the pressure box or the moisture of the fibrous web or of the fabric or of the felt by which the fibrous web is carried.

In a further advantageous embodiment, a cover has a straight, curved, undulating, zigzag or irregularly broken terminating edge on only one transverse or longitudinal side or a plurality of sides. Under particular circumstances, the cover also has openings, for example in the form of drilled holes or apertures.

In a further refinement of the invention, between the roll shell and a cover there are arranged spacers, in particular in the form of rods, wedges or strips, which can in particular be adjusted by the adjusting device.

A cover consists either of a single material or of a plurality of materials, in particular of a metal, a plastic and/or a composite material.

In the following text, the invention is to be explained in more detail by using a number of exemplary embodiments. In the appended drawing:

figure 1 shows a schematic cross section with a plurality of covers 5,
figure 2 with a continuous cover 5,
figure 3 with two covers 5, 10 arranged on the inside and outside after the pressure box in the direction of rotation, and
figure 4 shows the two covers 5, 10 according to figure 3, which can be adjusted via spacers and an adjusting device.

The rolls are suction rolls having a perforated, rotatable roll shell 1, such as are used in paper machines, in particular in the former during sheet formation, in the press section and in the drying section.

These suction rolls are wrapped around here by an air-permeable belt 3, that is to say for example a fabric or a felt or a belt consisting of another material, and the fibrous web 2 located on the outside, the negative pressure region 9 being located in the wrap region. This negative pressure region 9 is formed by a stationary pressure box 6 in the roll interior which is open toward the roll shell 1. The interior of the pressure box 6 is connected to a negative pressure source. In order to minimize the air leakage, the pressure box 6 is sealed off completely with respect to the roll shell 1 by sealing elements 5 in the form of sealing strips.

In this way, the negative pressure of the pressure box 6 through the holes of the perforation of the roll shell 1 effects attraction of the fibrous web 2 by suction onto the air-permeable belt 3 in the pressure region 9.

In figure 1, the axial sealing elements 7 are adjoined by air-impermeable covers 5 running in the circumferential direction. These covers 5 have only a small spacing of less than 10 mm from the roll shell 1, the distance increasing away from the pressure box 6. In another design, the distance between the roll shell 1 and one of the covers 5 or both covers 5 remains constant.

At the inlet to the pressure box 6, these covers 5 reduce air leakage and, at the outlet, the ventilation of the perforation from the interior of the roll. As a

result, there is a considerable reduction in the emission of noise.

As can be seen in figure 1, the ventilation of the perforation, in which a negative pressure prevails at the exit from the pressure region 9, can take place substantially only by means of an air flow 8 from outside. This air flow 8 is already hindered by the water mist present in the region of the suction roll. Furthermore, a negative pressure forms in the pocket opening between the belt 3 and the suction roll, which counteracts ventilation of the perforation to a considerable extent.

As a result, the ventilation takes place substantially more gradually and therefore without noise. At the inlet, the cover 5 covers approximately a region of 25° and, at the outlet, of 50°.

In figure 2, a design is shown in which the cover 5 extends in the circumferential direction over the entire region located outside the pressure box 6. This entirely prevents ventilation from the inside, in particular when the distance between the cover 5 and the roll shell 1 lies in the range of a few millimeters or the cover 5 is even in contact with the roll shell 1.

Axially, the covers 5 here extend over the entire perforated region of the roll shell 1.

In a further refinement (fig. 3), in addition to the cover 5, there is a further cover 10 on the outside of the roll shell 1, in the pocket formed by the latter with the belt 3. The two covers 5, 10 can preferably be adjusted via joints 11 and 12.

In a further embodiment of the suction or blow roll (fig. 4), spacers 13, 14 are fitted to the cover 5 and spacers 15, 16 to the cover 10. The spacers 13 to 16 consist either of plastic or metal; they may be configured in the shape of wedges; for example, they are wearing plastic parts which can easily be replaced.

The spacers 13 to 16 are formed either as rods or as sealing strips, in particular from sheet metal. The sealing strips can also be present in addition to the spacers 13 to 16. In particular in the case of the cover 10 fitted to the outside of the roll shell 1, the spacers 15, 16 ensure the maintenance of the desired spacing between the roll shell 1 and the cover 10, since the latter is attracted by the roll shell 1 on account of the low component section modulus. The component section modulus characterizes the intensity of the deformation under external loading. In this case, a lower deformation signifies a high section modulus and vice versa.

The position of the covers 5, 10 is changed by adjusting devices 17 and 18. These are connected to the spacers 13, 14 and 15, 16 via pressure lines 19, 20, for example, so that the spacing of the covers 5, 10 with respect to the roll shell 1 both at the leading end and the trailing end of the covers 5, 10 can be changed hydraulically or pneumatically by means of a fluid medium (oil, water, air) supplied via the lines 19, 20. Alternatively or additionally, provision is made for the angle of attack of the covers 5, 10 to be adjusted, the joints 11, 12 being influenced by the devices 17, 18 via appropriate lines.

In an alternative refinement, the devices 17, 18 influence the positions as a result of the fact that there are mechanical adjusting means, for example in the form of threaded spindles. The spacings of the

devices 17, 18 can be changed by means of appropriate configurations of the devices 17, 18 either over the entire width of the covers 5, 10 exclusively or else at points or in specific sections of the covers 5, 10. By means of the devices 17, 18, distance regulation in the radial and/or axial direction is thus possible.

The devices 17, 18 have signal variables applied to them by measuring devices, for example, it being possible, for example, for the sound level determined outside the roll or the pressure measured in the pressure box 6 to be used as controlled variable.